

PU020052 (JP11220694) ON 8596

- (19) Patent Agency of Japan (JP)
- (12) Official report on patent publication (A)
- (11) Publication number: 11-220694
- (43) Date of publication of application: 10.08.1999
- (51) Int.Cl. H04N 5/92 H04N 7/32
- (21) Application number: 10-021151
- (22) Date of filing: 02.02.1998
- (71) Applicant: Sony Corp
- (72) Inventor: Kato Motoki, Yonemitsu Jun, Senda Yoshinari

(54) Title of the invention: Signal transmitting method/device and signal recording medium

(57) Abstract:

Problem to be solved: To eliminate the re-encoding of a transmitted video signal and to reduce the data amount of an encoding bit stream by substituting a macro block constituting a frame for a skipped macro block and outputting it.

Solution: A video signal read by a read part 2 is sent to a memory 3, which stores the video signal. A rewrite part 5 rewrites the macro block on a prescribed frame accumulated in a buffer 4. Namely, the rewrite part 5 rewrites at least a part of the macro block constituting the prescribed frame accumulated in the buffer 4 into a skipped macro block. The video signal including the frame rewritten into the skipped macro block in the rewrite part 5 is sent to IEEE 1394 and is inputted to a

recording device 8 and a monitor with MPEG decoder 9. The recording device 8 records the video signal in a signal recording medium.

[Claims]

[Claim 1] A signal transmitting method including a read-out process of reading encoded bit streams including a video signal by which prediction coding was carried out at least from a signal recording medium, a rewriting process of transposing at least a part of macro block which copies a predetermined frame of a video signal which was read in the mentioned above read-out process, and by which the mentioned above prediction coding was carried out and constitutes the frame to a skipped macro block (skipped macro block), an output process which outputs the mentioned above frame with which the mentioned above macro block was replaced to the mentioned above skipped macro block in the mentioned above rewriting process.

[Claim 2] The signal transmitting method according to claim 1 transposing a macro block which constitutes the mentioned above frame which copied in the mentioned above rewriting process to the mentioned above skipped macro block when the mentioned above frame is a picture inner coding picture.

[Claim 3] The signal transmitting method according to claim 1 transposing a macro block which constitutes the mentioned above frame which copied in the mentioned above rewriting process to the mentioned above skipped

macro block when the mentioned above frame is a forward prediction coding picture.

[Claim 4] The signal transmitting method according to claim 1 characterized by outputting the frame concerned as a bidirectional prediction coding picture as it is from the mentioned above output process when the mentioned above frame is a bidirectional prediction coding picture.

[Claim 5] The signal transmitting method according to claim 1 transposing at least a part of macro block which copies a frame of a video signal which was stored in the mentioned above memory in the mentioned above memory process, and by which the mentioned above prediction coding was carried out and constitutes the frame to a skipped macro block, the memory process of storing temporarily in a memory a video signal which was read in the mentioned above read-out process and by which the mentioned above prediction coding was carried out in the mentioned above rewriting process.

[Claim 6] The signal transmitting method according to claim 1 including the display process of decoding and displaying a video signal by which the mentioned above prediction coding was carried out.

[Claim 7] A signal transmission device including a reading means which reads encoded bit streams including a video signal by which prediction coding was carried out at least from a signal recording medium, a rewriting means which transposes at least a part of

macro block which copies a predetermined frame of a video signal which the mentioned above reading means read, and by which the mentioned above prediction coding was carried out and constitutes the frame to a skipped macro block, an output means which outputs the mentioned above frame with which the mentioned above macro block was replaced to the mentioned above skipped macro block by the mentioned above rewriting means.

[Claim 8] The signal transmission device according to claim 7 characterized by that the mentioned above rewriting means transposes a macro block which constitutes the mentioned above frame which copied to the mentioned above skipped macro block when the mentioned above frame is a picture inner coding picture.

[Claim 9] The signal transmission device according to claim 7 characterized by that the mentioned above rewriting means transposes a macro block which constitutes a the mentioned above frame which copied to the mentioned above skipped macro block, when the mentioned above frame is a forward prediction coding picture.

[Claim 10] The signal transmission device according to claim 7 characterized by outputting the frame concerned as a bidirectional prediction coding picture as it is from the mentioned above output means when

the mentioned above frame is a bidirectional prediction coding picture.

[Claim 11] The signal transmission device according to claim 7 transposing at least a part of macro block which copies a frame of a video signal which was stored in the mentioned above memory, and by which the mentioned above prediction coding was carried out and constitutes the frame to a skipped macro block, a memory which stores temporarily a video signal which the mentioned above reading means read, and by which the mentioned above prediction coding was carried out and in the mentioned above rewriting means.

[Claim 12] The signal transmission device according to claim 7 including further a decode means which decodes a video signal by which the mentioned above prediction coding was carried out and a displaying means which displays a video signal decoded by this decode means.

[Claim 13] A signal recording medium characterized by that a macro block which constitutes at least one frame in a plurality of frames which constitute the same picture is made into a skipped macro block, a frame which constitutes the same picture is a signal recording medium which it records at least.

[Claim 14] The signal recording medium according to claim 13 characterized by that the mentioned above macro block which constitutes other frames is transposed to the mentioned above skipped macro

block, when at least one frame in a plurality of frames which constitute the same picture is a picture inner coding picture.

[Claim 15] The signal recording medium according to claim 13 characterized by that the mentioned above macro block which constitutes other frames is transposed to the mentioned above skipped macro block, when at least one frame in a plurality of frames which constitute the same picture is a forward prediction coding picture.

[Claim 16] The signal recording medium according to claim 13 characterized by that the mentioned above macro block which constitutes other frames is transposed to the mentioned above skipped macro block, when at least one frame in a plurality of frames which constitute the same picture is a bidirectional prediction-coding picture.

[Detailed description of the invention]

[0001] [Field of the invention] This invention relates to the signal transmitting method which transmits the video signal by which prediction coding was carried out, a signal transmission device, and the signal recording medium with which the video signal by which prediction coding was carried out is recorded.

[0002] [Description of the prior art] A signal reproduction device is one of the devices which play the information signal currently recorded on signal recording media, such as a disk.

This signal reproduction device reproduces the video signal currently recorded on the mentioned above signal recording medium, for example, is outputting it to the monitor etc.

[0003] For example, there are some still playback and whose slow reproduction are made possible about the predetermined frame of the video signal reproduced from the mentioned above signal recording medium in the mentioned above signal reproduction device.

[0004] There are some which prediction coding of the frame is carried out by MPEG (Moving Picture Coding Experts Group) method, and are recorded in the mentioned above disk. In this case, the frame played from a disk is made into the decoded digital video signal and is outputted to a monitor etc.

[0005] There are 3 kinds of coding modes in coding of the picture by the mentioned above MPEG system. One is the mode in which prediction coding is not performed, the frame obtained is called a picture inner coding picture (Intra Picture and «I picture» next). One is the mode in which forward prediction is applied, the frame obtained is called a forward prediction coding picture (Predictive Picture and «P picture» next).

Another is the mode in which forward prediction and backward prediction are applied, the frame obtained is called a bidirectional prediction coding picture (Bidirectionally Predictive Picture and «B picture» next).

[0006] A decoder is carried in the signal reproduction device which plays from a disk the video signal including such a frame by which prediction coding was carried out, and it is equipped with the memory for performing further still playback and slow reproduction which were mentioned above. That is, a decoder is a part which decodes the video signal which is carrying out prediction coding, a memory is used as the part which stores the frame of the decoded video signal concerned, and, thus, a signal reproduction device performs still playback by repeating and outputting the frame stored in the memory.

[0007] [Problems to be solved by the invention] By the way, the case where the video signal reproduced including still playback, slow reproduction, etc. is again recorded on a signal recording medium, when sending to the external connection device which has a decoder, a video signal including the mentioned above still playback and the picture that carried out slow reproduction is usually re-encoded, and it records on a signal recording medium or has sent to the mentioned above external connection device.

[0008] However, if what was once decoded in the signal reproduction device in this way is re-encoded, the image quality which prediction coding is carried out as mentioned above, and is constituted will deteriorate.

If all the same pictures inputted by still playback or slow reproduction are re-encoded, encoding efficiency is not necessarily good.

[0009] Next, even if it is a case where this invention is made in view of the mentioned above actual condition, carry out adjustable-speed reproduction of the video signal by which prediction coding is carried out, and it records on a signal recording medium again, degradation of the video signal concerned is prevented and it aims at offer of the signal transmitting method, a signal transmission device and a signal recording medium that can raise encoding efficiency more.

[0010]

[Means for solving the problem] A signal transmitting method according to this invention is provided with a read-out process of reading encoded bit streams including a video signal by which prediction coding was carried out at least from a signal recording medium in order to solve the mentioned above technical problem, a rewriting process of transposing at least a part of macro block which copies a predetermined frame of a video signal which was read in a read-out process, and by which prediction coding was carried out, and constitutes the frame to a skipped macro block (skipped macro block), an output process which outputs a frame with which a macro block was replaced to a skipped macro block in a rewriting process.

[0011] This signal transmitting method rewrites at least a part of macro block which constitutes at least one frame in a plurality of frames which consist of the same picture transmitted by adjustable-speed reproduction etc. in a rewriting process to a skipped macro block.

Thus, as for a video signal transmitted by a signal transmitting method, re-encoding becomes unnecessary, and its data volume as encoded bit streams decreases.

[0012] In order that a signal transmission device according to this invention may solve the mentioned above technical problem, a reading means which reads encoded bit streams including a video signal by which prediction coding was carried out at least from a signal recording medium, a rewriting means which transposes at least a part of macro block which copies a predetermined frame of a video signal which a reading means read, and by which prediction coding was carried out, and constitutes the frame to a skipped macro block, it has with an output means which outputs a frame with which a macro block was replaced to the mentioned above skipped macro block by rewriting means.

[0013] This signal transmission device rewrites at least a part of macro block which constitutes at least one frame in a plurality of frames which consist of the same picture transmitted by adjustable-speed reproduction etc. by a rewriting means to a skipped macro block.

Thus, as for a video signal transmitted from a signal transmission device, re-encoding becomes unnecessary, and its data volume as encoded bit streams decreases.

[0014] In order that a signal recording medium according to this invention may solve the mentioned above technical problem, a frame which constitutes the same picture is a signal recording medium which it comes to record at least, and a macro block which constitutes at least one frame in a plurality of frames which constitute the same picture is a plurality of skipped macro blocks.

[0015] Thus, even if a signal recording medium is a case where a frame which constitutes the same picture is recorded, it is what has small data volume.

[0016] [Embodiment of the invention] Next, an embodiment of the invention is described with reference to drawings. This embodiment is a signal reproduction device which reproduces the video signal which is constituted with the application of the signal transmission device according to this invention, and includes the frame by which prediction coding is carried out. For example, the video signal which this signal reproduction device reproduces is a video signal encoded with the MPEG system from the video signal and digital video tape recorder of satellite broadcasting from a set top box.

[0017] In this embodiment, the case where the video signal which includes the frame by which prediction coding is carried out with what is called MPEG (Moving Picture Coding Experts Group) method with a signal reproduction device is reproduced is explained.

[0018] Here, there are three kinds of coding modes in coding of the mentioned above MPEG system. One is the mode in which prediction coding is not performed by inter-frame, and the frame obtained is called a picture inner coding picture (Intra Picture and «I picture» next). One is the mode in which forward prediction is applied and the frame obtained is called a forward prediction coding picture (Predictive Picture and «P picture» next). Another is the mode in which forward prediction and backward prediction are applied, and the frame obtained is called a bidirectional prediction coding picture (Bidirectionally Predictive Picture and «B picture» next). That is, if it is in the mentioned above P picture and B picture, it becomes a frame for which the frame (reference frame) to refer to is needed.

[0019] The mentioned above signal reproduction device is provided with the read part 2 which is a reading means which reads the encoded bit streams including the predetermined frame of the video signal by which prediction coding was carried out at least from a signal recording medium as shown on drawing 1, the memory 3 which stores temporarily the video signal which the

read part 2 read, and by which the mentioned above prediction coding was carried out, the rewrite part 5 which transposes at least a part of macro block which copies the frame of the video signal which was stored in the memory 3, and by which the mentioned above prediction coding was carried out and constitutes the frame to a skipped macro block (skipped macro block).

[0020] Also, the signal reproduction device 1 is provided with the decoder 6 which decodes the video signal stored in the memory 3 as an image display system, the monitor 7 which displays the image of the digital video signal decoded by the decoder 6, the monitor 7 is a monitor by which external connection is carried out to the signal reproduction device 1.

[0021] And external connection of the monitor 9 with MPEG decoder which decodes the recorder 8 which records the video signal by which rewriting processing was carried out in the mentioned above rewrite part 5 on signal recording media, such as a magneto-optical disc, and the image by which prediction coding was carried out with the MPEG system is carried out to the signal reproduction device 1. For example, the signal reproduction device 1 is connected with the mentioned above recorder 8 and the monitor 9 with MPEG decoder via the interface of IEEE1394.

[0022] While the signal reproduction device 1 displays the mentioned above video signal read by the read part 2 on the monitor 7 by constituting in this way, it can

transmit to the mentioned above recorder 8. While the video signal read in the read part 2 is decoded by the decoder 6 by this, the same picture as the picture concerned which is decoded and is displayed on the monitor 7 is recordable on a signal recording medium in the recorder 8. That is, with the signal reproduction device 1, while reproducing a video signal, it is recordable on a signal recording medium again.

[0023] Next, each part which constitutes the signal reproduction device 1 is explained.

[0024] The mentioned above read part 2 is a part into which the video signal encoded with the MPEG system from the satellite broadcasting and digital video tape recorder from a set top box is inputted, as mentioned above. This example explains the read part 2 below about the case where it constitutes as a part that reads a video signal from a signal recording medium with MPEG system. The mentioned above video signal read by this read part 2 is sent out to the memory 3.

[0025] The mentioned above memory 3 is a part that stores a video signal temporarily as above mentioned. This memory 3 is constituted by semiconductor memory, for example. The video signal stored in the memory 3 is sent out to the mentioned above decoder 6 and the buffer 4.

[0026] The decoder 6 is a part which decodes the video signal by which prediction coding is carried out with the inputted the mentioned above MPEG system.

The video signal decoded by this decoder 6 is displayed on the monitor 7 as an image of the digital video signal. [0027] The buffer 4 into which the video signal sent out from the mentioned above memory 3 is inputted is a part which accumulates the predetermined frame of the mentioned above video signal. For example, the buffer 4 accumulates the predetermined frame of the mentioned above video signal in the case of adjustable-speed reproduction, such as still playback and slow reproduction.

[0028] The mentioned above rewrite part 5 is a part which performs rewriting processing of a macro block about the predetermined frame accumulated in the buffer 4. That is, the rewrite part 5 performs replacement processing which transposes at least a part of macro block which constitutes the mentioned above prescribed frame accumulated in the buffer 4 to a skipped macro block, as mentioned above.

[0029] As shown on drawing 2, a macro block is transposed to skipped macro block SB by this replacement processing. That is, the both ends of a slice are used as the header MBH of a macro block, and, otherwise, all are set to skipped macro block SM.

[0030] Here, the mentioned above skipped macro block SB is information when repeating a previous image, and is a macro block by which data volume is lessened markedly compared with the original macro block which is prescribed by the MPEG standard and is

similarly specified by MPEG standard. It becomes recordable to a recording medium about the frame concerned by transposing the macro block in a frame to a skipped macro block, without re-encoding.

[0031] The header MBH of the mentioned above macro block, it is the macro block used as the part that is not omissible in MPEG standard, it is the macro block which set macroblock_type to MC and Not Coded (macro block which transmits macro block address information and the motion vector of (0, 0) and does not transmit a DCT coefficient).

[0032] In MPEG standard, the skipped macro block about I picture is not specified, namely, the replacement part 5 performs the mentioned above replacement processing as a P picture about the mentioned above replacement processing about I picture.

[0033] By performing replacement processing to this appearance, the data volume of the frame was markedly reduced from the data volume of the frame before the mentioned above replacement processing.

[0034] The video signal which includes in a skipped macro block the frame by which replacement processing was carried out is sent out to IEEE1394 by the mentioned above replacement part 5, and is inputted into the mentioned above recorder 8 and the monitor 9 with MPEG decoder.

[0035] The recorder 8 records the mentioned above video signal on a signal recording medium.

The monitor 9 with MPEG decoder decodes the mentioned above video signal, is made into the digital video signal and displays an image.

[0036] Each part of the signal reproduction device 1 is constituted as mentioned above.

[0037] Next, the signal reproduction device 1 constituted in this way explains the case where adjustable-speed reproduction of still playback or slow reproduction is performed. While that still image or slow picture is displayed in the monitor 7 at the time of this still playback or slow reproduction, that video signal is sent out to the recorder 8 and the monitor 9 with MPEG decoder.

[0038] And when the signal reproduction device 1 performs the mentioned above adjustable-speed reproduction, it processes with procedure as shown on drawing 3. Namely, as shown on drawing 3, in a read-out process (Step S1), reading a bit stream including the video signal by which prediction coding was carried out at least from a signal recording medium, and according to a writing process (Step S2). the prescribed frame of the video signal which was read in the mentioned above read-out process (Step S1) and by which prediction coding was carried out being copied, and at least a part of macro block which constitutes the frame to a skipped macro block, rewriting and according to the output process (Step S3), the macro block is outputting the

frame currently transposed to the skipped macro block in the mentioned above rewriting process (Step S2).

[0039] First, the case of still playback is explained in details. In still playback, predetermined time duplication reproduction of the frame is carried out, and the predetermined time output of the frame made into B I picture, P picture or a picture in this case is copied and carried out.

[0040] Here, when were considered as still playback by I picture and it was the former, the first I picture was copied and predetermined time reproduction was carried out. That is, in the former, it was copied and all the copy frames outputted were made into I picture. However, although the signal reproduction device 1 that is an embodiment of the invention makes I picture the picture outputted first, it is outputting P picture in the output after it. That is, the signal reproduction device 1 is

$I-p_0-p_1-p_2-\dots-p_n$

Still playback is performed. Here, «I» is I picture of the mentioned above beginning. « p_0 », « p_1 », « p_2 », ..., « p_n » are the pictures obtained by forward prediction, namely, P picture. Here, after P picture p_0 is specifically a picture of the forward prediction from the first I picture, P picture p_1, p_2, \dots, p_n are the pictures of the forward prediction from the last P picture (namely, p_{n-1}). The replacement part 5 is performing conversion to such a P picture, for example.

[0041] And the signal reproduction device 1 is performing replacement processing which transposes the macro block part of the P picture concerned to a skipped macro block and which was mentioned above by the replacement part 5 to the mentioned above P picture p_1, p_2, \dots, p_n . That is, by the rewrite part 5, the signal reproduction device 1 reads a prescribed frame from the buffer 4, and as shown on drawing 2, it is transposing the part which constitutes the macro block of the prescribed frame concerned to skipped macro block SB.

[0042] In the still playback of I picture, it can transmit by changing into P picture the picture outputted repeatedly, transposing the macro block part of the P picture to a skipped macro block, and processing it further, as mentioned above, without re-encoding. Since the video signal by which still playback was carried out became that by which data volume was reduced by this and re-encoding was not required further, degradation of image quality was prevented.

[0043] Namely, in the former when, recording further the picture by which still playback was carried out to the monitor on a signal recording medium for example, since I picture reproduced first was copied and the predetermined time output was carried out as mentioned above, copied I picture was re-encoded to the signal recording medium, and was recorded on it, and there was a case where image quality deteriorated.

However, the signal reproduction device 1 which is an embodiment of the invention, also it does not require re-encoding by making a copy frame into P picture and transposing a macro block part to a skipped macro block further, the video signal with which data volume was reduced can be transmitted. By this, degradation of image quality will be prevented by the signal recording medium, and the video signal of still playback with which data volume was reduced conventionally will be recorded.

[0044] Thus, if it sees about a signal recording medium, a plurality of frames which consist of the same picture will be recorded, and the macro block which constitutes the copy frame of a plurality of frames concerned will be made into the skipped macro block. That is, a signal recording medium turns into a signal recording medium which recorded the picture I which consists of the same picture, $p_0, p_1, p_2, \dots, p_n$, when still playback of the I picture is carried out as mentioned above. Thus, even if a signal recording medium is a case where the picture by which still playback was carried out is recorded, let it be what has storage capacity less than the conventional signal recording medium.

[0045] As mentioned above, even if the video signal reproduced from the video signal and signal recording medium which are outputted to the recorder 8 by the signal reproduction device 1 includes the picture by which still playback was carried out, degradation of

image quality was prevented and the data volume of encoded bit streams lessened it.

[0046] By the way, about P picture in MPEG standard, the display order watch of the frame in a picture layer (GOP, Group of Picture) is prescribed by temporal reference (Temporal Reference). Thus, when there is no informing when still playback mode is canceled like still playback, the problem that it cannot opt for the mentioned above temporal reference arises. However, there is nothing that the decoder has decoded with reference to the mentioned above temporal reference actually, and it can be the mentioned above that it is not necessarily required. Next, if it is considered as the minimum, influence on next B picture can be made small.

[0047] Like in the case where it is considered as still playback by P picture, the mentioned above I picture, the signal reproduction device 1 can reduce the data volume of encoded bit streams while preventing degradation of the image quality of a video signal. The signal reproduction device 1 performs only processing which transposes the macro block which constitutes a frame to a skipped macro block about P picture.

Namely, the signal reproduction device 1 outputs the first P picture as a P picture as it is, only performs replacing a macro block with having performed the picture after it to I picture mentioned above to a skip macro block similarly, and outputs it as a P picture.

[0048] Thus, like the still playback of I picture, even if the signal reproduction device 1 is a case where still playback is carried out, it can prevent degradation of the picture of a video signal and can lessen data volume of encoded bit streams.

[0049] And in the case where still playback of the P picture is carried out, the copy frame on which the signal recording medium with which a video signal is recorded in the recorder 8 is copied by still playback is P picture, and the macro block is transposed to the skipped macro block.

[0050] The signal reproduction device 1 copies and outputs the first B picture and B picture of the information that all the macro blocks are the same, about the case where it is considered as still playback by B picture. Thus, B picture outputted repeatedly carries out motion compensation prediction coding by the same method as B picture which it changed into the still state. It is good also as what has the same B picture and all the information which simplified in this case and it changed into the still state in B picture outputted repeatedly. It is because there is not that in which the decoder has decoded this with reference to a temporal reference actually although the mentioned above temporal reference of a picture header serves as violation of a standard of MPEG at this time and it is not necessarily required.

[0051] Next, the case where slow reproduction is carried out with the signal reproduction device 1 is explained. In slow reproduction, duplication reproduction of the frame is carried out with a certain time interval, and the frame constituted by any of I picture, P picture, B picture in this case is outputted with a certain time interval. For example, in general slow reproduction, it is reproduced at about $1/2$ to $1/10$ speed of ordinary reproduction speed. Below, the slow reproduction in the case of the reproduction speed $1/2$ is explained as an example.

[0052] In this slow reproduction, it is replacing like the still playback mentioned above as the identical image outputted by slow reproduction, namely, a P picture which constituted the copy frame from a skipped macro block.

[0053] For example, the sequence about a picture layer which is set to what is called GOP (Group of Picture), $I_{00}-B_{10}-B_{20}-P_{30}-B_{40}-B_{50}-P_{60}, \dots$, when considered, the picture of the frame outputted by slow reproduction, it becomes

$I_{00}-p_{01}-B_{10}-b_{11}-B_{20}-b_{21}-P_{30}-p_{31}-B_{40}-b_{41}-B_{50}-b_{51}-P_{60}-p_{61} \dots$

[0054] Here, picture I_{00} described above is I picture reproduced in the usual reproduction, picture P_{30} , P_{60} are P pictures reproduced in the usual reproduction, picture B_{10} , B_{20} , B_{40} , B_{50} are B pictures reproduced in the usual reproduction.

[0055] And picture p_{01} constitutes a copy frame in slow reproduction, is the picture which copied picture I_{00} and was transposed to the skipped macro block in the macro block, and is constituted as a P picture.

[0056] Picture p_{31}, p_{61} , it is the picture which constitutes a copy frame in slow reproduction, copied each picture P_{30}, P_{60} and was transposed to the skipped macro block in the macro block, and is a picture outputted as it is as a P picture.

[0057] Picture $b_{11}, b_{21}, b_{41}, b_{51}$ are copy frames in slow reproduction and each picture $B_{10}, B_{20}, B_{40}, B_{50}$, and all the macro blocks are the pictures outputted as it is as a B picture of the same information.

[0058] An order needed when decoding is usually determined as follows. Namely, B picture is made into a bidirectional prediction-coding picture, and for the prediction coding, in the picture layer which includes as mentioned above needing a reference frame from the frame reproduced in the slow reproduction mentioned above, about prediction coding of B picture B_{10} and B_{20} . From needing I picture I_{00} and P picture P_{30} at least, about prediction coding of B picture B_{40} and B_{50} . From needing P picture P_{30} and P_{60} at least.

$I_{00}-p_{01}-P_{30}-B_{10}-b_{11}-B_{20}-b_{21}-p_{31}-P_{60}-B_{40}-b_{41}-B_{50}-b_{51}-p_{61}-\dots$
The signal reproduction device 1 carries out rewriting to record, and outputs a picture with such an order to an external connection device etc.

For example, it is transposed to the above order by this, and the picture rewritten for record is recorded on a signal recording medium.

[0059] In adjustable-speed reproduction whose signal reproduction device 1 is like still playback and slow reproduction as mentioned above, by transposing the macro block which constitutes the frame copied to a skipped macro block, degradation of the image quality of a video signal can be prevented and data volume of encoded bit streams can be lessened further.

[0060] There is small storage capacity and a signal recording medium also ends, even if it is a case where the video signal including the frame copied is recorded.

[0061] The memory 3 with which the signal reproduction device 1 shown as an embodiment of the invention is provided can also consist of a hard disk, a magneto-optical disc, etc.

[0062] [Effect of the invention] The read-out process to which the signal transmitting method according to this invention reads encoded bit streams including the video signal by which prediction coding was carried out at least from a signal recording medium, the rewriting process of transposing at least a part of macro block which copies the predetermined frame of the video signal which was read in the read-out process, and by which prediction coding was carried out, and constitutes the frame to a skipped macro block, when a macro block has an output process which outputs the frame

transposed to the skipped macro block in a rewriting process, it can make it possible to lose re-encoding of the video signal to transmit, and the data volume of encoded bit streams can be reduced.

[0063] Thus, even if a signal transmitting method is a case where carry out adjustable-speed reproduction of the video signal by which prediction coding is carried out, and it records on a signal recording medium again, it can prevent degradation of the video signal concerned and can raise encoding efficiency further.

[0064] The reading means to which the signal transmission device according to this invention reads encoded bit streams including the video signal by which prediction coding was carried out at least from a signal recording medium, the rewriting means which transposes at least a part of macro block which copies the predetermined frame of the video signal which the reading means read, and by which prediction coding was carried out, and constitutes the frame to a skipped macro block, by having an output means which outputs the frame with which the macro block was replaced to the mentioned above skipped macro block by the rewriting means, it can make it possible to lose re-encoding of the video signal to transmit, and the data volume of encoded bit streams can be reduced.

[0065] Thus, even if a signal transmission device is a case where carry out adjustable-speed reproduction of the video signal by which prediction coding is carried

out, and it records on a signal recording medium again, it can prevent degradation of the video signal concerned and can raise encoding efficiency further.

[0066] The signal recording medium according to this invention is a signal recording medium with which it comes at least to record a plurality of frames which constitute the same picture, even if you are a case where the frame which constitutes the same picture by making into the skipped macro block the macro block which constitutes at least one frame in a plurality of frames which constitute the same picture is being recorded, data volume is small.

[Brief description of the drawings]

[Drawing 1] is a block circuit diagram showing the composition of the signal reproduction device that is an embodiment of the invention.

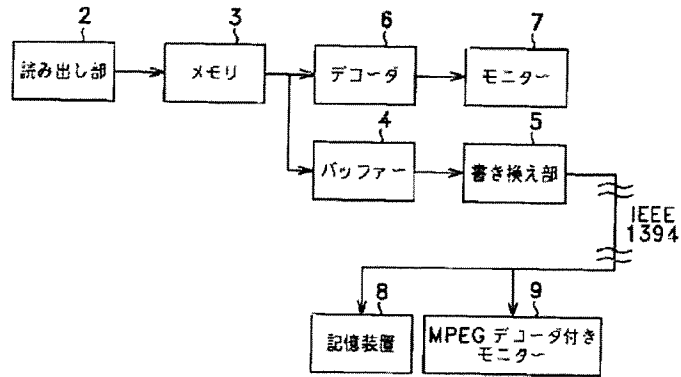
[Drawing 2] is a drawing in which a macro block part shows the frame transposed to the skipped macro block by the replacement part of the mentioned above signal reproduction device.

[Drawing 3] is a flow chart which shows a procedure in case the mentioned above recording and reproducing device performs adjustable-speed reproduction.

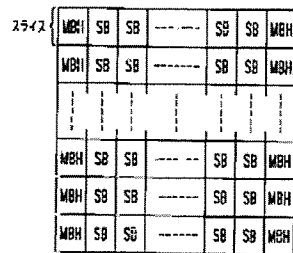
[Description of numerals]

- 1 A signal reproduction device,
- 2 A read part,
- 3 A memory,
- 5 rewrite part

Drawing 1



Drawing 2



Drawing 3

